Strategy Research Project

THE JORDAN RIVER: SOURCE OF LIFE AND SOURCE OF CONFLICT

BY

COMMANDER STEVEN J. BOWSER
United States Navy

USAWC CLASS OF 2010

U.S. Army War College, Carlisle Barracks, PA 17013-5050

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
30 MAR 2010		

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
The Jordan River: Source of Life and Source of Conflict	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
Steven Bowser	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
U.S. Army War College ,122 Forbes Ave.,Carlisle,PA,17013-5220	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT
see attached

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**		**32**	

The U.S. Army War College is accredited by the Commission on Higher Education of the Middle State Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, (215) 662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

USAWC STRATEGY RESEARCH PROJECT

THE JORDAN RIVER: SOURCE OF LIFE AND SOURCE OF CONFLICT

by

Commander Steven J. Bowser
United States Navy

Dr. Richard L. Winslow
Project Adviser

This SRP is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The U.S. Army War College is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, (215) 662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

U.S. Army War College
CARLISLE BARRACKS, PENNSYLVANIA 17013

ABSTRACT

AUTHOR: Commander Steven J. Bowser

TITLE: The Jordan River: Source of Life and Source of Conflict

FORMAT: Strategy Research Project

DATE: 25 March 2010 WORD COUNT: 6,039 PAGES: 32

KEY TERMS: Middle East, Arab-Israeli conflict, hydrology

CLASSIFICATION: Unclassified

Clean fresh water is the lifeblood of human existence. In some parts of the world, this essential resource is undeniably quite scarce - a scarcity which contributes to the belief that violence or armed conflict over water will eventually occur. This perception is no more strongly held than in one of the planet's most severely water-stressed regions - the Jordan River basin in the Middle East. This essay strives to address the fundamental issue of how fresh water could be the cause of violence or armed conflict in the western Middle East. It examines a number of the more significant areas where water is a recognized challenge between the populations and governments of that part of the world and suggests the relative significance that water plays as a determinant of conflict in each of those areas. In the end, it affirms the widely held belief that water has an important role in conflict generation, while at the same time, it suggests that in some areas where water-related issues exist, other determinants are present that relegate water to a secondary factor of potential conflict.

THE JORDAN RIVER: SOURCE OF LIFE AND SOURCE OF CONFLICT

Whiskey is for drinking, water is for fighting over.

—Samuel Langhorne Clemens[1]

It is an unfortunate reality that the world is currently facing a global fresh water crisis - one which many believe will eventually lead to violence or armed conflict. While there are some who think that this is a crisis of scarcity (certainly the physical availability of water is a grave concern in some locations), the issue of a global water *shortage* is, at best, debatable.[2] What very few would argue, however, is that water is not in the right place in the right quantity; that there is a disparity between those who have ready access to it and those who do not. With predicted near-term population growth as it is, all indications are that this diverging trend will continue in the coming years and that the fresh water resources of the globe will continue to be a source of stress for many people.

Consider for a moment that water is a basic element of human survival, that human beings require a minimum of 20 liters per day to meet their most basic needs.[3] With that in mind, at present, almost 900 million people worldwide, or just less than one in eight, lack access to safe and clean water supplies.[4] Emphasizing the fact that water which many consume or otherwise use is not suitable for such use, statistics show that over 3.5 million people die each year from water-related diseases.[5] Perhaps more alarming, in 2006, the world lost one child approximately every 15 seconds due to a water borne disease or under-nourishment.[6] Moreover, absent effective action, as many as four billion people could live in countries that find it difficult or impossible to

mobilize the water resources needed to meet the needs of agriculture, industry and households by 2030.[7]

When one considers that, as of today, some 40 percent of the world's population lives in river and lake basins that span one or more international boundaries, at least 214 basins are shared by more than two countries, 13 are shared by more than five, and almost 50 countries on four continents have three-quarters of their land in international water basins,[8] it is easy to conclude that water is more than just a localized issue for some parts of the world.

Unlike wars and natural disasters, this water crisis does not make media headlines. Nor does it galvanize concerted international action. Yet, as these statistics suggest, the challenges of equitable availability coupled with transboundary issues make it a truly serious and complex one. This is no more evident than in the Middle East, arguably the world's most severely water-stressed region, where more than 90 percent of usable water crosses international boundaries.[9]

Few regions of the world offer a more varied physical geography or a richer mix of ethnicities, religions, languages, societies, cultures and politics than the Middle East. At the same time, no segment of the globe presents its diverse aspects in such a mixture of conflicts and complexities. From this, one issue emerges as the most conspicuous, cross-cutting and problematic - fresh water. Its scarcity and rapid diminution happen to occur in some of the driest parts of an area where there are also some of the fiercest national animosities. Water in the Middle East is thus a conflict-laden determinant of both the domestic and external policies of the region's principal actors. In an already over-heated atmosphere of political hostility, insufficient water to

satisfy human, developmental and security needs among all nations of the Middle East heightens the ambient tensions.[10]

Since at least the mid-1980s through present day, numerous world leaders and many authors (e.g. Bulloch, Darwish and Starr)[11] and other subject matter experts, as well as most lay persons with whom this author discussed the topic during the writing of this essay, have opined or currently hold the opinion that “water wars” in this region of the world are imminent. In the particularly dry summer of 1990, King Hussein of Jordan stated that the only reason which might bring Jordan to war again was water.[12] Then later in the mid-1990s, former United Nations Secretary General Boutros Boutros-Ghali repeatedly said that the next war in the Middle East would be about water not politics.[13]

To some, such statements are "exaggerated and misleading".[14] Nonetheless, they do draw attention to an important problem. Though Boutros-Ghali's prediction did not come to pass, a future war over water is not out of the question. Conflicts are still generally determined by deep political differences and the danger of another war in the Middle East has not yet been averted despite the best efforts of many well-intentioned people. Yet, this region clearly remains one of the tensest areas of the world where hydrological matters undeniably infuse an additional dimension to that conflict.

The region contains three major river systems – the Tigris-Euphrates, the Nile and the Jordan. Each has unique characteristics and attributes. One aspect of the Jordan River system that makes it unique among those three is the ongoing Arab-Israeli tension in that region. The five political entities (Israel, Jordan, Lebanon, Syria and the Occupied Palestinian Territories of West Bank and Gaza Strip) that comprise the Jordan River basin depend, to varying degrees, on the use of its surface and ground waters to

meet their individual fresh water demand. More importantly, though, it is generally considered an almost universal agreement that these fresh water resources are also a source of contention among them.

Many rightfully conclude that this is one of the driest, most water-stressed regions of the world. As shown in Table 1[15], available hydrological metrics[16] of just this

Country	Resources	Withdrawal Rate	Surplus/Deficit
Israel	119	305	-186
Jordan	131	177	-46
Gaza Strip	46	127.5	-81.5
Lebanon	1328	385	943
Syria	411	1048	-637
West Bank	383	91.5	291.5
United States	6932	1600	5332

Table 1.

region from 2001 not only generically validate that widely held belief, but also specifically reveal that four of the concerned parties (Israel, Jordan, Syria and the Gaza Strip) are “water deficit” parties. Further, when compared to the United States, it is clear that water resources and usage rates are extremely low for all of the geo-political entities.

Accepting the conclusion that this area is an exceptionally dry part of the world coupled with the foundation of existing tension, conflict where fresh water is, at a minimum, a contributing factor seems more likely to erupt here than in other parts of the Middle East.

It is for that reason that the subject of this essay is the Jordan River basin. Its purpose is to address the fundamental issue of how water could be the cause of violence or armed conflict in this region of the world. To illustrate to what degree water

is a determinate of conflict, it will examine numerous hydrological and geo-political features, coupled with a basic review of the recent history of six general water features of the region. Those six features are:

1. The Litani River
2. The Hasbani River
3. A group of water related assets that includes the Banias spring, the Hula Swamp, Lake Tiberias and Israel's National Water Carrier[17], hereafter collectively referred to as the headwaters of the Jordan
4. The Yarmuk River
5. The West Bank and Gaza aquifers, as well as the Jordan River as it pertains to the Occupied Palestinian Territories
6. The Arava Valley

Through the course of the presentation, it will affirm the opinion of many that water, indeed, can be a factor in the outbreak of violence in this region. But, at the same time, it should also become clear that if conflict does erupt, water will likely not be the only cause that leads to that conflict.

In order to begin to understand this complex situation, a more detailed description of the Jordan River system itself is necessary. As shown in Figure 1[18], this river rises from the confluence of three major springs and streams located on the southern and western slopes of Mount Hermon, the summit of which is in Syria, but borders Lebanon and the Israeli controlled Golan Heights. The largest tributary is the Dan and the other two are the Hasbani and the Banias streams. The streams unite about six and a half kilometers south of the Lebanon-Israel border. These springs

usually provide 50 percent of the water of the upper Jordan, the rest coming from surface runoff in the rainy winter months. The discharge flows into the northern end of the Ghawr, which is the valley of the Dead Sea and the northern extremity of the Great Rift Valley that runs south to Africa, ending at Mozambique.[19]

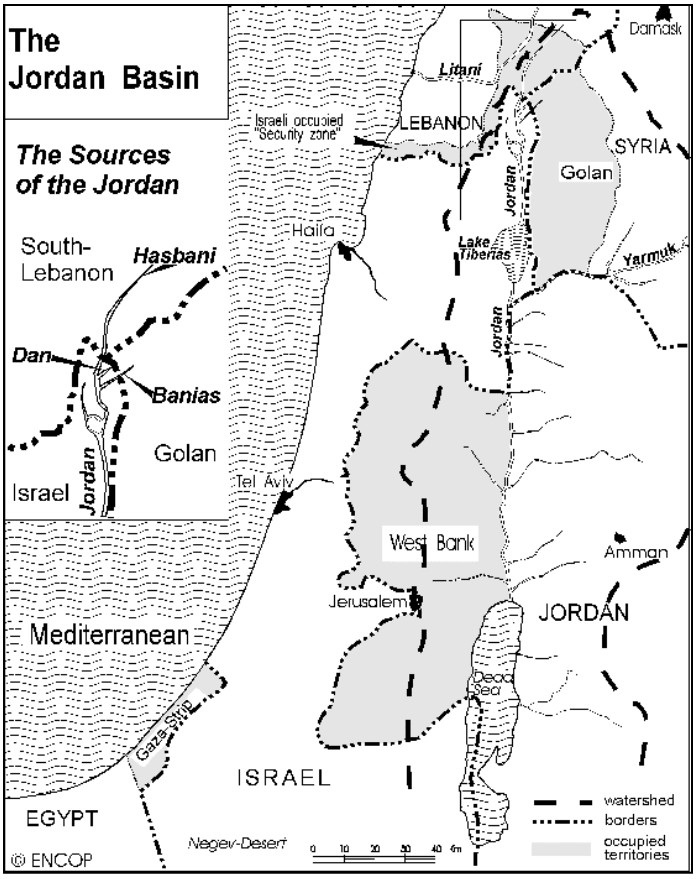

Figure 1. – Map of The Jordan Basin

The upper Jordan River flows swiftly through the Hula Valley, additional water coming to it from minor springs and Wadi Barayghit. Just over six kilometers south of the Jordan's outlet from Lake Hula, the water course deepens and the river runs for sixteen kilometers, plunging 260 meters. The central Jordan begins north of Lake Tiberias (also called the Sea of Galilee or Lake Kinneret), leaving the southern exit of the lake, where it meets up with a few more streams and most importantly with its main

tributary, the Yarmuk River. The Yarmuk flows from the east and forms the border between Syria and the Kingdom of Jordan as it flows westward to enter the Jordan River ten kilometers south of the Sea of Galilee at 300 meters feet below sea level. The lower Jordan River flows southward, dropping to 400 meters below sea level, and empties into the Dead Sea, a great salt lake whose surface level is the lowest point on Earth's surface. The total length of the Jordan River from the confluence of the Dan, Hasbani and the Banias to the Dead Sea is 360 kilometers.[20]

As one might expect, the sources of potential conflict begin almost where the Jordan River itself begins – at it headwaters in Lebanon, in the northwest quadrant of the Jordan River watershed. However, while this is certainly the case and a point that will eventually be addressed, there is also the issue of the Litani River, which, in the minds of many Lebanese, today plays a significant role in Israeli-Lebanese relations.

The Litani is a stream flowing entirely within the international recognized borders of Lebanon, with no connection to the Jordan River watershed. However, there has been a long standing interest by Israel in the waters of this river dating back to the beginning of the 20th century when the first plans to found a Jewish home in Palestine were born. At the Paris Conference marking the end of World War I, the Zionist World Organization proposed to include the lower course of the Litani into the British Palestine Mandate. Later, in the early 1950s, when the United States became actively involved in Jordan River basin water planning, Israel tried to include the Litani waters into the subsequent negotiations over a regional water-sharing regime. The Israeli invasion of Southern Lebanon in 1982 and the permanent occupation of a strip of land including a portion of the lower course of the Litani after Israel's partial withdrawal in 1985 raised

new fears that those projects to divert the Litani waters southward would now be put into practice.[21]

Lebanese newspapers and politicians repeatedly accused Israel of working on a diversion scheme or even having already begun to extract water.[22] These accusations have always been rejected by Israel. Past interest in the Litani is acknowledged, but present occupation of the "South Lebanese Security Zone" is claimed to be related only to national security issues alone. The best evidence indicates that there have been no Israeli withdrawals from the Litani River to date, except for supply of stationed troops, nor construction of infrastructure to support such a withdrawal[23]. Moreover, the flow of the Litani has been diminishing in its lower course in the last decades due to Lebanese diversions upstream, both for irrigation and power generation. The remaining usable flow amounts to no more than 125 million cubic meters (mcm), thus likely diminishing Israeli interest in a great diversion scheme.

On the other hand, the idea of increasing Israel's water supply by importing water from the Litani has not been permanently archived. Into the 1990s, several Israeli experts (e.g. Kally and Fishelson)[24] continued to propose diverting the remaining Litani waters to the south as a means of alleviating water scarcity in Israel.

Therefore, the issue of the Litani has not yet been put to rest permanently and remains as a potential source of future conflict. Further, given the absence of any other major source of contention, it seems fair to conclude that if conflict does occur, water is likely to be a leading cause. The risk of that happening, however, appears relatively low as it seems unlikely that Israel would attempt a unilateral diversion of the Litani without an explicit agreement.

Returning now to the issue of the headwaters of the Jordan River, itself, it must be emphasized that the resources in question here are not of the same importance for the three riparian parties – Israel, Lebanon and Syria. From an Israeli point of view, water originating in the Golan Heights and Southern Lebanon represents more than 50 percent[25] of the supply feeding the upper Jordan River and Lake Tiberias, Israel's main water provider. On the other hand, these sources potentially represent no more than a few percent of the total water supply in Syria and Lebanon.[26] For these two countries, the streams might be of local but not national importance, since both are riparian states of other important rivers – the aforementioned Litani and the Tigris and Euphrates Rivers, respectively.

Additionally, Lebanon holds an even more distinct advantage over the other two in that it currently has very little direct reliance on any surface water from any other country to meets it current demand.[27] In fact, as previously presented in this narrative, most available data suggests that Lebanon is a water-surplus state (see Table 1.). Sitting in the strategic geographical position that it does, Lebanon contains a number of key Jordan River assets and, as result, is a key party in the use of the waters of the Jordan River basin. Specifically, it contains the two primary springs that feed the headwaters of the Hasbani, which runs for 40 kilometers in Lebanon before crossing the border and joining with the Banias and Dan Rivers at a point in northern Israel, to form the Jordan. One of these springs is considered very important as it is the only continuous year-round flow in the river in either Lebanon or Israel.[28]

It is an easy conclusion to reach then that changed usage patterns regarding any one of these assets, could increase the attention of Lebanon's neighbors, especially its

immediate downstream neighbor, Israel, and that sensitivity could be a potential cause for conflict. In fact, history bears this out as issues surrounding these assets have been cause for saber-rattling and military action in the past.

One must look no further back in time than to 1964 when Lebanon, in conjunction with other Arab League partners launched a plan to divert significant amounts of water from the Jordan River tributaries which arise in the Golan Heights and in Southern Lebanon to Syria and Jordan for the development of those countries. The project was largely believed to be part of a broader anti-Israeli campaign which had been provoked by Israel's announcement that the beginning of pumping into its recently completed National Water Carrier was imminent. Technically difficult, with water to be pumped by the Arab League as high as 350 meters, and economically inefficient, the Arab plan was clearly politically motivated.[29] Above all, the diversion would have cut the installed capacity of the National Water Carrier by one third and increased the salinity of Lake Tiberias, thus likely collapsing Israel's water supply system[30]. Israeli leaders repeatedly warned the Arabs that the Jewish state regarded the continuity of the water flow as a matter of vital interest, and the Israeli army and air force attacked the work sites of the project several times between 1965 and 1967.[31]

More recently, in 2001 the Lebanese government installed a small pumping station to extract water to supply Ghajar, a small village on the border between Lebanon and the Israeli-occupied area of the Golan Heights, and it also diverted part of the Hasbani to supply Wazzani, a small village just north of the Israel-Lebanon border. While these recent actions were met with strong rhetoric from Ariel Sharon of Israel, calling them "casus belli" that could lead to war[32], direct military action was not taken.

Still this illustrates yet another “hot spot” in the region where conflict over water could occur. Like the Litani area, given the absence of any other major factor, if conflict does occur here, water is likely to be a leading cause. Unlike the Litani area, though, the risk of conflict over these waters seems a little greater, given the unbalanced needs of the riparian parties.

Further to the east, there is the matter of the Banias River, as mentioned, a tributary of the Jordan that originates from a spring in the Golan Heights and which essentially focuses attention on the tension between Israel and Syria, in the northeast quadrant of the Jordan River basin. This is an area where mainly sovereignty issues dominate the rhetoric, but also where water-related concerns remain unresolved and are a source of potential conflict between these two countries.

Throughout the 1950s and 1960s, the Jordan River was often at the center of the conflict in this contested territory. One dispute concerned the demilitarized zones on the Israeli-Syrian border after the Arab-Israeli war of 1948-1949. These zones were those areas of the British Palestine Mandate which Syria succeeded in occupying during the war. They comprised three areas of land, one of them on the eastern shore of Lake Tiberias, the others in the Upper Jordan Valley. According to a United Nations brokered armistice agreement, Syria was to withdraw its troops in return for a pledge that sovereignty of the disputed areas would remain undetermined until a peace settlement had been achieved. Subsequently differing interpretations of the demilitarized status of those areas caused repeated clashes and complaints. Since the zones gave access to Lake Tiberias and in one case crossed the Jordan River, these disputes were mostly triggered by hydropolitical matters.[33]

The first case concerned the Israeli plan in 1951 to drain the Hula swamps in the Upper Jordan Valley. This would have impinged on areas included in the central demilitarized zone. Syria regarded this as an infringement of the armistice agreement and reacted militarily. In the same year, Israel began the construction of its National Water Carrier. In an early version of the project, it planned to tap the Jordan River at a point upstream of Lake Tiberias, a location in one of the demilitarized zones. Again, Syria deployed its armed forces along the border and employed artillery units on the construction and engineering sites. Israel stopped work at this diversion site and moved to its current site on the northwestern shore of Lake Tiberias.[34]

Then, the territorial outcome of the Six Days' War in June 1967 radically changed Israel's hydropolitical position. By conquering the Golan Heights, it finally thwarted the Arab diversion plan begun in 1964 and achieved total control over the Banias. On the Hasbani, it got strategic control, since its course stretches only a few kilometers from the Golan Heights.[35]

Later, after the Lebanon campaign of 1982 and retention of the "Security Zone", Israel also got physical control over the Hasbani. Furthermore, Israel gained control of the whole eastern shore of Lake Tiberias and the mountains dominating this water body. Up to 1967, the border between Israel and Syria passed only about ten meters from the northeastern shore of the lake. Over time, Syria assumed control over this narrow strip and claimed use rights on the lake. This led to interference with Israeli fishing activities resulting in repeated military incidents and threats by Syria to contaminate the lake in retaliation.[36]

Another water-related dispute concerns the precise location of the Israeli-Syrian border. This question again refers to the problem of demilitarized zones in the aftermath of the Arab-Israeli war of 1948. When Syria speaks of total withdrawal from the Golan Heights, it usually refers to the boundaries as they were on June 4, 1967. Implicitly, this would again raise Syrian claims over those zones, the status of which had remained unclarified until that day. On the other hand, when indicating the possibility of total retirement from the Golan, Israeli representatives always refer to the international boundaries of the Palestine Mandate as set out in 1923, thus including the demilitarized zones within the borders of Israel.[37]

This issue is related to water since the areas in question cross the Jordan River in one section and represent parts of the shores of Lake Tiberias in another. By extending its sovereignty over the formerly demilitarized zones, Syria could demand part of the water rights to the lake and/or obstruct Israeli diversions.

Thus, the struggle over the headwaters of the Jordan River cannot be solely regarded as a genuine water conflict. Rather, water disputes must be regarded as part of the overall security dilemma in this part of the Middle East. But, as long as the political differences and the climate of mistrust between the parties persist, water will not only be considered a source of conflict, but will also be perceived as a potential weapon. In turn, territorial claims resulting from that perception complicate the situation and make it difficult to conclude that water would be the primary source.

Further downstream, just south of Lake Tiberias, another source of potential conflict centers around the Yarmuk River, the largest tributary of the Jordan.[38] Though, as a result of the "Treaty of Peace Between the State of Israel and the Hashemite

Kingdom of Jordan" of October 26, 1994, the impact of water on the potential for conflict between those two countries has been greatly reduced. In that agreement, Israel's annual share of the Yarmuk's waters was fixed at 25 mcm (plus 20 mcm which it is allowed to pump into Lake Tiberias in the winter, but has to return to Jordan in the summer) and entitled Jordan to the rest of the flow.[39] As a result, Israel accepted a consistent reduction compared to its 70 mcm Yarmuk River annual average consumption rate of the previous two decades. Similarly, that treaty granted Jordan the right to use a minimum amount of 30 mcm from the Jordan River.[40] Israel's share of the same was not stated, presumably leaving it to continue to consume its average pre-treaty amount of some 550 mcm.[41] With that, Jordan realized an infinitesimal increase in its use of water from the Jordan River, which until that time was virtually nothing. Despite these challenging concessions by Israel, both parties are presently mutually coexisting with each other and these terms.

However, it is important to note that historically this has not always been the case. Therefore, the potential exists then that the calm of the present day could degenerate to less cordial conditions, if stipulations of the peace treaty are not followed. Additionally, there are the actions of a wild card factor in this equation, Syria, that must be considered, as well.

The United States' efforts in the 1950s to negotiate an integrated development plan and a water-sharing regime between all the riparian parties resulted in the Johnston Plan that allocated annual amounts, from the upper Jordan, of 375 mcm, 100 mcm and 42 mcm of water for Israel, Jordan and Syria, respectively. From the Yarmuk River, it allocated 25 mcm, 377 mcm and 90 mcm to each, respectively.[42] However, the

agreement generated by the technical committees of all the parties involved, which included Lebanon in addition to Israel, Jordan and Syria, was never ratified on the governmental level because of the overwhelming political conflict. Though the plan was ultimately rejected by the Arab League, both Israel and Jordan undertook to abide by their allocations under the plan. Over time, adhering to those informal terms grew more and more challenging as the increasing demand for water slowly began to unravel the agreement. The outbreak of the Six Days' War and resultant political consequences soon dissolved those arrangements completely. During the war, Israel destroyed the works of a Jordanian dam on the Yarmuk. By occupying the Golan Heights, Israel gained complete control over the upper Jordan and over a longer portion of the northern shore of the Yarmuk, including the area facing the intake of Jordan's King Abdullah Canal.

Resulting from the 1967 war and due to its downstream position on the Jordan River and its weak strategic standing on the Yarmuk, Jordan was greatly disadvantaged in its water use opportunities. Beginning in the late 1960s and continuing through the early 1990s, Israel virtually monopolized the waters of the upper Jordan. Jordan was totally excluded from tapping this source, despite its having been allocated 100 mcm of the Jordan's water in the Johnston Plan.[43]

On the Yarmuk, Jordan suffered from long-standing Israeli obstructionism against building a storage system to improve water diversions into the King Abdullah Canal. After destroying the initiated dam during the war, in 1969, Israel again flew air raids against Jordanian water facilities, as retaliation for the perceived repeated infiltration of Palestinian "fedayeen" from Jordan's territory.[44] Israel subsequently impeded, on

repeated occasions, its neighbor from accomplishing maintenance works at the intake of the King Abdullah Canal. Additionally, for the better part of the 1970s and 1980s, Israel repeatedly vetoed the World Bank financing a joint Jordanian-Syrian dam at Makarin. In the 1970s, Israel began to divert greater amounts of the Yarmuk into Lake Tiberias. According to the estimates of several independent experts, (e.g. Lowi and U.S. Army Corps of Engineers)[45] these extractions rose up to 100 mcm in the mid-1980s. Later, these Israeli extractions seem to have been reduced during the years of drought between 1987 and 1991. Because of this, and due to increasing Syrian diversions on the upstream tributaries, the annual Jordanian quota on the Yarmuk remained restricted to just 120 to 130 mcm. This is three times less than the allocation expected in the Johnston Plan.[46]

The peace treaty of 1994 seems to have resigned that history to its rightful place and has created a lasting agreement to this day between Israel and Jordan. However, the treaty did not include Syria. Since Jordan remains a downstream riparian on the Yarmuk and lacks the military means to compensate its weak geographic position, it has to accept increased diversions by upstream riparian Syria. These annual extractions are presently estimated at 160 to 200 mcm, thus far surpassing the quota of 90 mcm assigned to Syria in 1955. According to some authors (e.g. Gruen),[47] Syria has plans to increase its annual extraction up to 244 mcm or more. Therefore, Jordan will presumably never get the 377 mcm from the Yarmuk which it had originally been allocated in the Johnston Plan.

So clearly, water, specifically allocation quotas and the building of storage and diversion facilities on a shared river basin, is central to the security equation in this part

of the region. Thus, the potential for this dispute to escalate in to violence or other armed conflict does exist. However, with the peace treaty of 1994 in place, it seems unlikely that this will occur in the near future between Israel and Jordan. Instead, future disputes over water rights on the Yarmuk River are more likely to develop between Jordan and Syria. Further, a dispute that results in violence or escalation of armed conflict between the two countries is likely to primarily result from water-related concerns, as there are really no other major tensions here.

Then there are the water-related issues in the Palestinian Territories. Here, the situation is more complicated because of the tension not just over surface water, but ground water, as well. Specifically, the major topics of water-related contention between the Israelis and the Palestinians center on four main concerns – use of the Jordan River, itself, aquifer restrictions, new Jewish settlements and perceived Israeli policy differences regarding the West Bank and the Gaza Strip.

First, there is the dispute between Israel and the Palestinians concerning the Palestinian claim on a share of the Jordan River. The Palestinians are now totally excluded from using the river, though the West Bank is a full riparian for a length of about 60 kilometers of the river and even takes its name because of its location relative to it. According to informal provisions in the Johnston negotiations of 1955, 70 to 150 mcm of Jordan-Yarmuk waters were supposed to be used on the West Bank. At the time, they made up part of Jordan's share, but, as a result of the Six Days' War, that provision was no longer recognized by Israel.[48]

Next, there are the measures that prevent Palestinians from developing the ground water resources of the West Bank in accordance with their growing social and

economic needs which were imposed by Israel almost immediately after the Six Days' War. Specifically, a series of military orders put exploitation of water resources under strict control of the Israeli administration, severely limiting Palestinian use.[49] These included a requirement for Palestinians to be granted permission by the Israeli authorities to drill wells, restrictions on the depth that Palestinians are allowed to drill in the West Bank and a prohibition on reforestation in the recharge area of the aquifers on which the West Bank sits.

Since occupation, drilling permits have been granted in very limited quantity, mainly to replace older wells which were exhausted. Only a small amount of those were for agricultural use.[50]

In the West Bank, Palestinians are only allowed to drill shallow wells of 60 to 140 meters, while, Mekorot, the contractor of Israel's water authority supplying the Jewish settlers, prefers to drill to depths of 300 to 400 meters, where higher flow rates and better quality water are found.[51] These deeper wells exacerbate the problem in that they tend to draw down the water tables that feed the shallower Palestinian wells, causing them to be drawn down to exhaustion.

In addition, reforestation is prohibited in the recharge area of the aquifers, except on private plots, in order to promote maximum run-off and thus recharging of the aquifers.[52]

Third, the fact that Israel has built new Jewish settlements in the Occupied Territories incites strong emotional reactions among the Palestinians.[53] Since settlements are usually supplied with water from local sources, this has increased the burden on the limited water supply in the Occupied Territories. Moreover, to enflame

tensions between the indigenous population and settlers even more, Palestinians also believe that settlers are systematically favored over them regarding water allocation, regularity of supply and pricing. While in 1992 Jewish settlers on the West Bank had at their disposal 50 mcm of water for a population of approximately 125,000 at the time, Palestinian consumption amounted to 110 mcm for more than one million people, thus showing a ratio in per capita use of nearly four to one in favor of the settlers. In the Gaza Strip, despite relatively low total consumption by the settlers (due to their limited absolute number), the per capita ratio of use between the two communities shows even more disproportionate levels of 12 to one.[54]

As a result of these policies, Israel, including the settlers, is presently utilizing nearly 80 percent of the shared waters of the West Bank, while Palestinians are left with less than 20 percent. To compound the inequity, Palestinians on the West Bank are forced to pay higher rates for their water supply. As many different figures have been published on this matter (e.g. Elmusa, Beschorner, Brooks and Lonergan)[55], it is hard to find exact agreeable figures to corroborate this statement. However, all agree that there is a high imbalance between prices paid by the settlers and those demanded of their Palestinian neighbors.

The Palestinians also believe there is a double standard in the Gaza Strip where the hydropolitical situation is the opposite of that in the West Bank.[56] Since the Gaza aquifer is in part recharged by water inflows from the adjacent Israeli territory, replenishment depends on Israeli behavior. Palestinians claim that, due to ground water extraction by Israeli wells near the border and construction of low dams upstream in Wadi Gaza, Israel is diminishing the natural recharge of the aquifer.[57] They also often

point out this apparent contradiction between Israel's insistence on its downstream riparian rights to the West Bank ground waters on one hand and its practice of making the best use of its upstream position in the case of the Gaza aquifer on the other.

In summary, the situation involving the Israelis and Palestinians is obvious complex. Much like the situation further north between Syria and Israel, the tension here is not just about water. Without delving in to the extreme complexities associated with the politics of this situation, suffice it to say that the fact that Israel is generally considered to be a recognized state and Palestine is struggling for a true identify and recognition on the world stage is really the overarching theme here and is the foundation on which the tension dwells. As such, it appears that these political differences create a setting where low-end violence that will eventually escalate into armed conflict is most likely to result. Although water-related issues are unlikely to be the primary factor, they will likely exacerbate the tension and disputes over those other issues.

Finally, furthest downstream, the ground water resources of the Arava Valley (also known as Wadi Araba) extending from south of the Dead Sea to the Gulf of Aqaba on both sides of the Israeli-Jordanian border are of some relevance and worth mentioning. This area is very arid, with annual precipitation less than 50 millimeters. The only water available can be found in subterranean basins, some of which are common to Israel and Jordan. Both countries have been implementing a variety of agricultural schemes on their respective sides of the border. Since there has been no coordination of activities, pumping was competitive, resulting in rapid depletion of the supplies and their increasing salinization.[58] The water-sharing dispute is in part related

to territorial controversies concerning some small plots of land which Israel conquered in the first Arab-Israeli War of 1948. Israeli farmers have been cultivating the land and using the wells located on it. However, the water amounts in question are limited. So far, Israel and Jordan seem to have been utilizing eight and four mcm respectively from these sources. Thus, neither party perceives these supplies to be nearly as significant as the waters from the Jordan-Yarmuk system. So here again, in this very southern part of the region, much like the issue of the Yarmuk to the north, water concerns are present as a single source of potential conflict, yet do not present a very high probability of that occurring.

In conclusion, the purpose of this essay was to address the fundamental issue of how water could be a cause of violence or armed conflict in the western Middle East. This research project provides a basic overview of six of the more significant areas where water is a recognized challenge. This short examination met the stated purpose, demonstrating that water plays a role in the possibility of conflict, significant in some cases and less so in others, in that region of the world. Of the six general areas included in this examination, water could be the primary determinant of conflict in four of them – the Litani River region, the Hasbani River region, the Yarmuk River region and the Arava Valley region. Interestingly, though, the information presented suggests that the likelihood of conflict occurring is relatively low in each of those areas. On the other hand, of the two areas where water would likely play a lesser role if conflict were to occur – the Jordan headwaters region, and the West Bank and Gaza aquifer regions, the probability of such conflict is far greater. While it was not the purpose of this paper to suggest the most likely location, time or parties of such violence or armed conflict,

these are interesting and compelling questions. A prediction of the answers to such questions requires further research, study and synthesis.

Endnotes

[1] This quote has been attributed to Samuel Langhorne Clemens, an American humorist, novelist, writer, and lecturer better known by his pen name Mark Twain, but until the attribution can be verified, the quote should not be regarded as authentic.

[2] United States Geological Survey, *Where is Earth's Water Located?*, http://ga.water.usgs.gov/edu/earthwherewater.html (accessed November 12, 2009). Conservative calculations indicate that of the 1,386,000 cubic kilometers of fresh water that exist on Earth, the 2/3 of one percent of that amount (93,100 cubic kilometers or 9.31e+16 liters) that is found in rivers and lakes (from where most humans get their water) is still enough to provide the globe's current population of 6.8 billion people with almost 13.7 million liters of water each or enough water to last them 187 years, if each person was responsible for the consumption of 200 liters per day – 10 times the recognized minimum daily amount required for basic survival. Of course, this does not consider the Earth's natural water cycle that replenishes and sustains this supply of water. So, it should be reasonable to suggest that the world is not really facing a shortage of overall water.

[3] United Nations Development Programme, *United Nations Human Development Report 2006* (New York: Palgrave Macmillan, 2006), 2.

[4] UNICEF/World Health Organization, *Progress on Drinking Water and Sanitation: Special Focus on Sanitation* (Geneva: WHO Press, 2008), 10.

[5] World Health Organization, *2008 Safer Water, Better Health: Costs, benefits and sustainability of interventions to protect and promote health* (Geneva: WHO Press, 2008), 13.

[6] United Nations Development Programme, *United Nations Human Development Report 2006*, 3.

[7] Organization for Economic Co-operation and Development (OECD), *OECD Environmental Outlook to 2030* (Paris: OECD, 2008), 7.

[8] Frances Cairncross, "Environmental Pragmatism," *Foreign Policy* 95 (Summer 1994): 43.

[9] Kevin Watkins and Anders Berntell, "A global problem: How to avoid war over water," *New York Times*, August 23, 2006.

[10] Masahiro Murakami, *Managing Water for Peace in the Middle East: Alternative Strategies* (Tokyo: United Nations University Press, 1995), 2.

[11] John Bulloch and Adel Darwish, *Water Wars: Coming Conflicts in the Middle East*, 2nd ed. (London; Victor Gollancz, 1993), 12 and Joyce R. Starr, ed., *A Shared Destiny* (New York: Praeger, 1991), 8.

[12] Patrick Cockburn, "Hussein vents his anger at Israel," *The Independent*, May 15, 1990.

[13] Asser Marin, BBC News *Obstacles to Peace: Water*, May 23, 2007, http://news.bbc.co.uk/2/hi/6666495.stm (accessed February 23, 2010).

[14] Stephen Libiszewski, *Water Disputes in the Jordan Basin Region and Their Role in the Resolution of the Arab-Israeli Conflict* (Zurich, Switzerland, 1995), 1.

[15] Used here, "Resources" represents internal renewable water resources (IRWR). As defined by the 2007 Food and Agriculture Organization of the United Nations Land and Water Development Division, IRWR is comprised of the average annual flow of rivers and recharge of ground water (aquifers) generated from endogenous (internal) precipitation. Natural incoming flows originating outside a country's borders are not included in the total. Even though IRWR measures a combination of surface and ground water resources, it is typically less than the sum of the two because of overlap--water resources that are counted with both surface and ground water. IRWR is calculated as follows: IRWR = surface water resources + ground water resources – overlap. It is measured in cubic meters per person (m^3/person). http://www.fao.org/nr/water/aquastat/regions/neast/index3.stm (accessed January 8, 2010). Also, used here, Withdrawal Rate represents fresh water withdrawal which is the annual quantity of water in cubic meters per person (m^3/person) removed from available sources for use in any purpose. Linked from the *CIA – The World Factbook Home Page* at "Fresh Water Withdrawal," https://www.cia.gov/library/publications/the-world-factbook/docs/notesanddefs.html (accessed January 8, 2010).

[16] Data for this table was compiled from the following sources: For Israel, water resource information was found at Water Resources and Freshwater Ecosystems – Israel, 2003, linked from the *World Resources Institute Earth Trends Home Page* at "Water Resources and Freshwater Ecosystems," http://earthtrends.wri.org/pdf_library/country_profiles/wat_cou_376.pdf (accessed January 8, 2010) and water withdrawal rate information was found at Israel, November 27, 2009, linked from the *CIA – The World Factbook Home Page* at "Middle East Region," https://www.cia.gov/library/publications/the-world-factbook/geos/is.html (accessed January 8, 2010). For Jordan, water resource information was found at Water Resources and Freshwater Ecosystems – Jordan, 2003, linked from the *World Resources Institute Earth Trends Home Page* at "Water Resources and Freshwater Ecosystems," http://earthtrends.wri.org/pdf_library/country_profiles/wat_cou_400.pdf (accessed January 8, 2010) and water withdrawal rate information was found at Jordan, November 27, 2009, linked from the *CIA – The World Factbook Home Page* at "Middle East region," https://www.cia.gov/library/publications/the-world-factbook/geos/countrytemplate_jo.html (accessed January 8, 2010). For Lebanon, water resource information was found at Water Resources and Freshwater Ecosystems – Lebanon, 2003, linked from the *World Resources Institute Earth Trends Home Page* at "Water Resources and Freshwater Ecosystems," http://earthtrends.wri.org/pdf_library/country_profiles/wat_cou_422.pdf (accessed January 8, 2010) and water withdrawal rate information was found at Lebanon, November 27, 2009, linked from the *CIA – The World Factbook Home Page* at "Middle East region," https://www.cia.gov/library/publications/the-world-factbook/geos/countrytemplate_le.html (accessed January 8, 2010). For Syria, water resource information was found at Water Resources and Freshwater Ecosystems – Syrian Arab Republic, 2003, linked from the *World Resources Institute Earth Trends Home Page* at "Water Resources and Freshwater Ecosystems," http://earthtrends.wri.org/pdf_library/country_profiles/wat_cou_760.pdf (accessed January 8, 2010) and water withdrawal rate information was found

at Syria, November 18, 2009, linked from the *CIA – The World Factbook Home Page* at "Middle East Region," https://www.cia.gov/library/publications/the-world-factbook/geos/countrytemplate_sy.html (accessed January 8, 2010). For the West Bank, the stated per capita internal renewable water resource figure of 383 m^3/person was calculated with data from Food and Agriculture Organization of the United Nations, *FAO Water Report 34* (Rome, Italy: United Nations Food and Agriculture Organization, 2009), 3 of annual internal renewable water resources 0.766 X 10^9 m^3 and West Bank population data linked from *Google Public Data Home Page* at "Palestinian Territories population" http://www.google.com/publicdata?ds=wb-wdi&met=sp_pop_totl&idim=country:WBG&dl=en&hl=en&q=west+bank+population (accessed January 8, 2010) of 2,008,010; water withdrawal rate information was found at Food and Agriculture Organization of the United Nations, *FAO Water Report 34* (Rome, Italy: United Nations Food and Agriculture Organization, 2009), 3. For the Gaza Strip, the stated per capita internal renewable water resource figure of 46 m^3/person was calculated with data from Food and Agriculture Organization of the United Nations, *FAO Water Report 34* (Rome, Italy: United Nations Food and Agriculture Organization, 2009), 3 of annual internal renewable water resources 0.046 X 10^9 m^3 and Gaza Strip population data linked from *Google Public Data Home Page* at "Palestinian Territories population" http://www.google.com/publicdata?ds=wb-wdi&met=sp_pop_totl&idim=country:WBG&dl=en&hl=en&q=west+bank+population (accessed January 8, 2010) of 1,008,011; water withdrawal rate information was found at Food and Agriculture Organization of the United Nations, *FAO Water Report 34* (Rome, Italy: United Nations Food and Agriculture Organization, 2009), 3. For the United States, water resource information was found at Water Resources and Freshwater Ecosystems – United States, 2003, linked from the *World Resources Institute Earth Trends Home Page* at "Water Resources and Freshwater Ecosystems," http://earthtrends.wri.org/pdf_library/country_profiles/wat_cou_840.pdf (accessed January 8, 2010) and water withdrawal rate information was found at United States, January 15, 2010, linked from the *CIA – The World Factbook Home Page* at "North America Region," https://www.cia.gov/library/publications/the-world-factbook/geos/us.html (accessed January 29, 2010).

[17] The National Water Carrier of Israel is used to transfer water from Lake Tiberias in the north of the country to the highly populated center and arid south and to enable efficient use of water and regulation of the water supply in the country. Up to 72,000 m^3 of water can flow through the carrier each hour, totaling 1.7 million cubic meters (mcm) in a day. The carrier is about 130 kilometers in length and consists of a system of giant pipes, open canals, tunnels, reservoirs and large scale pumping stations. Construction of this large scale project began in 1953 and ended in 1964. The National Water Carrier - 1964, March 12, 2010, linked from *The Department for Jewish Zionist Education Home Page* at The National Water Carrier - 1964, http://www.jafi.org.il/education/100/TIME/carrier.html (accessed March 12, 2010).

[18] Libiszewski, *Water Disputes in the Jordan Basin Region and Their Role in the Resolution of the Arab-Israeli Conflict*, 5.

[19] Jordan River linked from *Answers.com Home Page* at "Jordan River," http://www.answers.com/ topic/jordan-river (accessed January 14, 2010).

[20] Jordan River linked from *Encyclopedia Britannica.com Home Page* at "Jordan River," http://www.britannica.com/EBchecked/topic/306217/Jordan-River (accessed January 14, 2010).

[21] Nicholas Blanford, "Heightened Israeli-Lebanese Tensions Over Jordan's Headwaters," September 30, 2002, http://www.merip.org/mero/mero093002.html (accessed February 23, 2010).

[22] Hussein A. Amery, "Israel's Designs on Lebanese Water," *Middle East International*, (September 1993): 18-19, Hussein A. Amery and Atif Abdallah Kubursi, "The Litani River: The Case Against Interbasin Transfer," *Peace for Lebanon*, (1994): 174-194 and John K. Cooley, "The War over Water," *Foreign Policy*, no. 54 (1984): 3-26.

[23] Arnold Hottinger, "Wasser als Konfliktstoff: Eine Existenzfrage für Staaten des Nahen Ostens," *Europa Archiv*, no. 6, (1992): 156.

[24] Elisha Kally and Gideon Fishelson, *Water and Peace: Water Resources and the Arabi-Israeli Peace Process* (Westport, CT: Praeger Publishers, 1993), 94.

[25] Murakami, *Managing Water for Peace in the Middle East: Alternative Strategies*, 204.

[26] Ibid.

[27] Water Resources and Freshwater Ecosystems – Lebanon, 2003, linked from the *World Resources Institute Earth Trends Home Page* at "Water Resources and Freshwater Ecosystems," http://earthtrends.wri.org/pdf_library/country_profiles/wat_cou_422.pdf (accessed January 8, 2010).

[28] Blanford, "Heightened Israeli-Lebanese Tensions Over Jordan's Headwaters".

[29] Libiszewski, *Water Disputes in the Jordan Basin Region and Their Role in the Resolution of the Arab-Israeli Conflict*, 41.

[30] John Ross and Aaron Wolf, "The Impact of Scarce Water Resources on the Arab-Israeli Conflict," *Natural Resources Journal* 32, no. 4, (1992): 937.

[31] Miriam R Lowi, "Bridging the Divide: Transboundary Resource Disputes and the Case of West Bank Water," *International Security*, 18, no. 1, (1993): 125.

[32] BBC News, "Israel hardens stance on water," *BBC News*, September 17, 2002.

[33] Michael B. Oren, *Six Days of War: June 1967 and the Making of the Modern Middle East* (New York: Oxford University Press, 2002), 37.

[34] Ibid, 41.

[35] Ibid, 297.

[36] Benny Morris, *Righteous victims: a history of the Zionist-Arab conflict, 1881-1999* (New York, Knopf, 1999), 496.

[37] Ze'ev Schiff, "Assad is searching for Tohami," *Ha'aretz*, (May 19, 1995): B1.

[38] Yarmouk River linked from *Absolute Astronomy.com Home Page* at "Yarmouk River," http://www.absoluteastronomy.com/topics/Yarmouk_River (accessed March 2, 2010).

[39] Annex II, Article I, Paragraphs 1.a and 1.b of the *Treaty of Peace between the State of Israel and the Hashemite Kingdom of Jordan October 26, 1994*, http://www.mfa.gov.il/MFA/Peace%20Process/Guide%20to%20the%20Peace%20Process/Israel-Jordan%20Peace%20Treaty (accessed February 2, 2010).

[40] Annex II, Article I, Paragraphs 2.b and 2.d of the *Treaty of Peace between the State of Israel and the Hashemite Kingdom of Jordan October 26, 1994*, http://www.mfa.gov.il/MFA/Peace%20Process/Guide%20to%20the%20Peace%20Process/Israel-Jordan%20Peace%20Treaty (accessed February 2, 2010).

[41] Libiszewski, *Water Disputes in the Jordan Basin Region and Their Role in the Resolution of the Arab-Israeli Conflict*, 39.

[42] Murakami, *Managing Water for Peace in the Middle East: Alternative Strategies*, 295.

[43] Ibid.

[44] Aaron T. Wolf, *Hydropolitics along the Jordan River: Scarce Water and its Impact on the Arab-Israeli Conflict* (Tokyo: United Nations University Press, 1995), 54.

[45] Miriam R. Lowi, *West Bank Water Resources and the Resolution of Conflict in the Middle East. Occasional Paper Series of the Project on Environmental Change and Acute Conflict No. 1*. (Toronto, 1992), 181 and U.S. Army Corps of Engineers, *Water in the Sand: A Survey of Middle East Water Issues* (Washington, DC: U.S. Department of Defense, 1991).

[46] Murakami, *Managing Water for Peace in the Middle East: Alternative Strategies*, 295.

[47] George E. Gruen, *The Water Crisis: The Next Middle East Conflict.* A Simon Wiesenthal Center Report. (Los Angeles, 1992), 15.

[48] Ross and Wolf, "The Impact of Scarce Water Resources on the Arab-Israeli Conflict," 947.

[49] Amnesty International, *Troubled Waters – Palestinians Denied Access to Water* (London: Amnesty International Publications, 2009), 15.

[50] Jad Isaac, "Core Issues of the Palestinian-Israeli Water Dispute. Environmental Crisis: Regional Conflicts and Ways of Cooperation," ENCOP Occasional Paper, no. 14. (Zurich, Swiss Federal Institute of Technology/Swiss Peace Foundation: 2005): 12.

[51] Mekorot Facts and Figures linked from *Mekorot Home Page* at "Israel's Water Supply System," http://mekorot.co.il/Eng/Mekorot/Pages/IsraelsWaterSupplySystem.aspx (accessed February 23, 2010).

[52] John K. Cooley, "The War over Water," *Foreign Policy*, no. 54 (2004): 16.

[53] Amnesty International, *Troubled Waters – Palestinians Denied Access to Water*, 51.

[54] Karen Assaf, “Replenishment of Palestinian Waters by Artificial Recharge as a Non-controversial Option in Water Resource Management in the West Bank and Gaza Strip,” *Water and Peace in the Middle East. Studies in Environmental Science*, no. 58 (1994): 98.

[55] Sharif S. Elmusa, "Dividing the Common Palestinian-Israeli Waters: An International Water Law Approach," *Journal of Palestine Studies 22*, no. 3 (1993): 75., Natasha Beschorner, "Water and Instability in the Middle East," *Adelphi Paper*, no. 273 (1992): 14. and David B. Brooks and Stephen C. Lonergan, *The Economic, Ecological and Geopolitical Dimensions of Water in Israel* (Victoria, Canada: Centre for Sustainable Regional Development, 1993), 92.

[56] Amnesty International, *Troubled Waters – Palestinians Denied Access to Water*, 31.

[57] Palestinian Environmental Protection Authority, *Gaza Environmental Profile. Part One: Inventory of Resources*, (Gaza: Palestinian Environmental Protection Authority, 2006), 23.

[58] Miriam R. Lowi, *West Bank Water Resources and the Resolution of Conflict in the Middle East. Occasional Paper Series of the Project on Environmental Change and Acute Conflict No. 1*. (Toronto, 1992), 182.